BIO-DYNAMICS

A periodical furthering soil conservation and increased fertility in order to improve nutrition and health.

FALL 1960

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AVAILABLE, WATER-SOLUBLE OR STORAGE: HUMUS DECIDES THE ISSUE

EHRENFRIED E. PFEIFFER

(*From one Non-Scientist to Another*:

Through our years of editing this quarterly we have frequently heard the sad comment from some of our lay readers that they find the "scientific" papers that appear here among other things to be rather rough going. That they are, nevertheless, worth careful reading by EVERY *person interested in better farms and gardens is clearly illustrated by the article that follows.*

Near the very end there is, for instance, the presentation of the idea that in "soil conservation", of which we hear so much, there must come to be included along with the physical, mechanical concept, and water conservation, the practice of CHEMICAL CONSERVATION. *This thought could only appear after the reasons for it had been laid out. If it were to take hold in thinking and practice, it would mean a true revolution in agriculture. Then, there is a clear answer to the question most frequently asked in the informal, between-sessions get-togethers at B.D. conferences: "What is really the difference between organic farming and gardening and biodynamic farming and gardening?" And all through the presentation as it is developed there are other such items. They cannot be presented as a journalist would feature them.*

F. H., Asstnt. Ed.)

Three concepts govern our thinking about the relationship between soil and nutrients suitable for plants and their absorption by plant roots. These are: water soluble, available and exchangeable. A mineral or organic substance which is water soluble, a salt, for instance, or a sugar, is easily transported and therefore also, so it seems, absorbed. Potassium salts, ammonia and nitrates fulfill this condition and are therefore thought to be ideal fertilizers. However, a plant root seems to be also able to extract and absorb substances which are not water soluble but become absorbable in contact with weak organic acids or by other means. These substances, then, are called "available". One example is phosphate, which may exist in different states or compounds, from soluble, to available, to completely insoluble. In the last case, one speaks of it as being "tied down" or "fixed". Another example is organic nitrogen. In this case, the nitrogen

is fixed to organic compounds in living as well as dead matter in soil, bacteria or other microorganisms or plant parts; it is present in protein, amino acids, polypeptides, etc., etc., and eventually transformed into the simple compounds which can be absorbed by roots.

Then, there is that process in soil in which insoluble complex minerals are transformed by the so-called ion exchange and broken down, with the final result that some of these components become available or even water soluble.

The theory of mineral nutrition of plants points out (a) that a crop removes a certain amount of mineral elements from the soil, mainly nitrogen compounds, phosphates and potash, but also calcium, magnesium and, more recently included, also trace minerals; (b) that the minerals which have been removed must be replaced lest the soil lose its fertility (Liebig and followers); (c) that there is a dynamic relationship or balance, so that in plant growth, not only the mere presence or absence of a substance (any substance) determines the issue, but that substance is decisive which is present (available or soluble) in the minimum (law of the minimum, Mitcherlich).

These concepts have influenced modern thinking in agriculture and have created especially the use of certain norms in the determination or labeling of fertilizers which are commercially available. For the protection of the customer (the farmer in this case), a certain formula of nitrogen, phosphate and potash (NPK) must be declared. The trend was to increase the percentages of nitrogen, phosphates, etc., and to speak of low formula (low grade) vs. high formula NPK fertilizers. Thus, a farmer may believe that a 10-10-10 formula suits him better than a 2-2-2, and if he gets a super or triple phosphate, that is the thing to use.

The facts which have led to these concepts of mineral fertilization are based on observations in the laboratory, growth in a closed system (Mitcherlich vessels, for instance), and growth in nutrient solution (hydroponics) with a complete or incomplete supply, verified in plot tests, in the field and with many different plants. It is important, therefore, to realize that the terms "water soluble" and "available" mean, first of all, soluble or available in the laboratory. Also, the tests required to prove or certify a fertilizer formula are designed in such a way that they operate with these terms in the laboratory. If a phosphate is declared "available", it means available with regard to the laboratory test; for in the soil the condition might be entirely

different and such available phosphates might become entirely unavailable — so unavailable or "tied down", as one says, that they remain locked up and only a small percentage goes into the plants. In alkaline soils, available phosphates can become entirely unavailable. Beltsville tracer studies some years ago showed that, of the applied phosphates, only 2% to 10% showed up in the plant, while the balance was tied down in the soil and had become unavailable.

For decades it was thought that only available phosphates were useful and that natural rock, because of its unavailability of phosphate, had no value. Then the above, already mentioned tying down of available phosphate in soils became known. The availability of phosphate to plant roots in a biologically balanced soil system is entirely different from the chemical laboratory availability. Practical experience has shown that many rock phosphates can become quite available in soils, slowly but steadily. Even the most available laboratory phosphate can be fixed, as inert iron or aluminum compounds, becoming a total loss. On the contrary, laboratory unavailable phosphate can become root available in organic systems.

"In superphosphate granulated *with humus*,(*) the nutritive substances are utilized by the plant literally several (3 to 5) times more effectively than in the usual powdered superphosphate, and this is equivalent to tripling the quantity of these fertilizers." "Large doses of powdered superphosphate are applied because earlier agrochemical scientists have not presented us with a method of raising the coefficient of utilization by plants of the phosphorus introduced into the soil by the superphosphate." So it was stated by a Russian agronomist in 1952; therefore: "superphosphate granulated with *humus*,(*) on the farm".(1)

Russian agriculturists have for many years applied bacterialized fertilizer with great success. It is only Western conceit, by the way, (which has become so embarrassing in Sputnik matters) which still by-passes these problems of humus and bacterial action in soils and composts.

The formula on the fertilizer bag, therefore, does not say "plant available" at all but only "laboratory available", according to the definitions which were set by soil chemists. In reality, it guarantees the formula only as long as the fertilizer is in the

(*) Our italics.

bag. Years ago it was violently contended that only available superphosphates could do the trick, while natural rock phosphate was no good. Nowadays, one knows that a super or triple phosphate can be tied down as well as a rock phosphate and that the availability depends on soil reaction and biological conditions in the soil. With quick and fast release, little may be gained especially if it happens at the wrong time.

The case history of potash is extremely interesting. According to the law, it must be water soluble. "Water soluble" in a soil means that the salt goes easily where water moves: upward into the plant or downward away from it; eventually into the drain. If it goes upward into the plant easily, maybe too easily, a phenomenon has been observed which is called "luxury consumption" of potash. Especially forage crops, grasses and legumes may absorb 5 to 6 times more potash than is normal and good for them and the animals which feed on them.

In order to balance these excessive amounts in their internal, cellular metabolism, plants absorb more water too, so that they get more watery; vegetables are reduced in firmness, taste and keeping qualities. In Switzerland, with excess of soluble potash, it was observed that the cattle suffered and the milk from such cows would not make cheese. In such a case, therefore, the addition of water soluble potash is about the worst thing one can do. It would be much better to have a stable form of exchangeable potash, from which the plant roots can draw at their discretion.

But let the experts speak[2]: "Only very small amounts are got in solution in soil water at any time, but when present in fair supply it seems to be readily available to the plant. This exchangeable form is got in the clay colloids and is clearly connected with humus . . . Clay minerals and organic matter have a certain exchange capacity, and potash constitutes 1 to 3% of this. These exchangeable forms become a reservoir of plant food built up by plant residue, humus, fertilizers, farmyard manure, liquid manure, etc. . . . It is an accepted fact that exchangeable potassium is the dominant available form in well drained soils, but in mineral soils generally it is less than 1% of the total."

If a soil contains 40,000 to 50,000 lbs. of potash per acre, as we found years ago and the above quoted agronomist confirms, then the amount of exchangeable potash may be only a few hundred pounds/acre and the water soluble potash may be only 10 to 20 lbs./acre. Now, there exists a law of equilibrium, so that one form may change to another, and this process is reversible. Organic matter — not crude, raw or half decomposed

but biologically active and stabilized organic matter — in the form of humus — is in the key position, in which it acts as storage, to hold, to absorb, to avoid leaching but have ready when the need arises.

Plant roots excrete organic acids and enzymes which, in turn, favor microorganisms which, in turn, release more organic acids and enzymes, so that in a biologically active soil there is a continuous process of give and take, release and absorption, availability and taking into storage. As soon as we consider this biological process, the problem is no longer to have an excess of water soluble potash but to have a source of total potash which is made available by way of the biological process.

F. Lyle Wynd in "Feed the Soil"[2] writes: ". . . The nutritional aspects of soil fertility depend on the activities of living microorganisms and on the electrical properties of its non-living colloidal components . . . The supply of nitrogen, phosphorus and sulfur, and of many other plant foods as well, is completely dependent on the metabolic cycles undergone by these microorganisms . . . Many people erroneously believe that chemical plant food, plus dead organic matter, constitute fertility." The question, therefore, is not to feed the plant directly, which is a wasteful practice, but to feed the soil first, which in turn will be able to feed the plants which, as Wynd says, obtain their foods from this colloidal and dynamic, biologically complex organization, "in a manner of speaking, only by permission of the soil".

Let us hear our potash expert again: "Some immobilization of potash may be an advantage as it adds to the soil reserve, and in fact reduces the loss of potash by: (a) leaching; (b) excess absorption or luxury consumption by the plant over its needs when the soluble potassium is too high. Incidentally, this latter action by the plant would reduce the uptake of calcium and magnesium. Fixation of potash in fact is best regarded as a build up of that which might otherwise be lost . . . To this end a build up of organic matter is very desirable."[2]

Sandy soils with a low organic and colloidal matter content, especially in wet seasons, tend to lose soluble potash by leaching. Peat soils too with a low biological process (some peats are almost sterile) show lack of potash. The remedy in both cases is to build up humus, to mobilize soil life. Our recent studies of organic matter and composts have revealed the truth of this statement in many ways.

We feel urged now to introduce two new concepts: root available and root acceptable. Unless a mineral like water soluble potash is forced into the root, these very same plant roots have a selective property. It is not at all stated that an available substance will be selected or absorbed; this depends on the biological balance and on the equilibrium, which may or may not be present.

Humus and colloidal matter in soil are the balancing elements which act as storage and release plant nutrients to the extent that the plant roots and microlife in soil make them available and acceptable. A concept which was gained by the behavior of minerals in nutrient solutions does not cover the entirely different conditions of exchange in a balanced root-humus-soil-soil life system, that is, an organic system.

We feel a responsibility here to point out that not everything which is commonly called compost or organic matter satisfies the concept of a balanced humus system. For crude organic matter, in the breaking down or initial rotting state (for instance, leaves, stems, garbage), because of its easily soluble compounds such as potash salt, will actually lose these salts by leaching. It is only in the stabilized, colloidal, humus-containing state of compost that soluble salts are protected. For that reason, we have found many crude composts as well as "overdone", mineralized composts to be rather low in total potash, a fact which is frequently overlooked. The need for correction by way of adding potash compounds arises, therefore, when producing composts. To add water soluble source material would mean only to add that which gets lost by leaching. If the right microlife with its organic acid and enzyme production has been established, potash can be balanced in a compost. Under such circumstances, one can even use potash containing-minerals such as granite or gneiss in powdered form; that is, materials with very little water soluble or laboratory available potash but accessible to bacterial action so that this potash can be easily put into circulation. A process which is otherwise seen in nature as the slow weathering of rock is tremendously speeded up in an organic living and balanced system so that this potash is removed from storage and becomes accessible to roots.

We find that in well-balanced and rotted composts only a very small amount of water soluble potash is present, but applied to soils, all potash which apparently was tied down to the organic matter and not even accessible to laboratory extraction methods, becomes available to plant roots. These will not be

"flooded" with potash solution, but a slow, steady intake is safeguarded.

Different granites or gneisses behave very differently. A certain gneiss from Georgia, HYBRO-TITE, was especially satisfactory in this regard. This potash rock is also used as poultry grit, and it was observed that in the gizzard of the chick the digestibility of the feed is increased in the presence of this grit, not only because of mechanical irritation but apparently also because of enzymatic stimulation. This property of easy availability depends somewhat on the nature of the potash rock — whether easily oxidizable, whether of a geologically younger or older formation and origin. Red, white or green granite behaves quite differently in this regard. Each source material needs to be evaluated independently.

Exactly the same principles apply to the nitrogen problem. In stable humus we find practically no free ammonia, only a limited amount of nitrate, but a large amount of organic nitrogen. This organic nitrogen is contained in the proteins, amino acids and other compounds of the life of microorganisms in soil and compost.

Again, we have the easily soluble compounds, ammonia and nitrate, which, in nutrient solutions, are so easily absorbed by roots and, in soils, are so easily lost. Again we have the phenomenon of excess consumption, which deceives many a farmer because he gets that well known lush green color and leaf growth. Easily available nitrogen "shows". It also causes problems, for instance, lots of leaves but not fruit (strawberries, tomatoes, fruit trees), excess ammonia or nitrate and nitrites in the sap of plants, which is considered quite toxic, so that tolerances need to be established. If ammonia or nitrate wash out into the substrata so that they finally show up in ground water and well water, it makes these water supplies unfit for consumption. Here topsoils did not hold the excess of soluble nitrogen compounds. We also see that excess nitrogen causes imbalances, so that potash is not properly used by plants. Potash deficiencies in plant tissues appear in the midst of plenty of potash in the soil. Heavy application of nitrogen can cause serious potash deficiency. Balance again is what is necessary. Organically bound nitrogen represents a reserve from which the soil and plant root can draw at its discretion; a slow but steady release of nitrogen enhances the building up of protein and improves the protein quality and amino acid pattern in the plants.

It is estimated that about 5% of the total organic matter in

a soil is present as nitrogen in various compounds.

The top layer of soil is estimated at 2 million pounds per acre. 2% organic matter means 40,000 lbs./acre. 5% of this is nitrogen. A soil with 2% organic matter, therefore, has a reserve of 2,000 lbs. of nitrogen; a soil with 3% has a reserve of 3,000 lbs., and so on. Nitrifying or ammonifying microorganisms transform a small fraction of this storage material to nitrate or ammonia, enough in a living soil to sustain plant growth. If we feed these organisms and otherwise care for a proper balance, pH or soil reaction included, the biological process in soil and compost will make these resources available. Again, a reversible process is installed. It has been demonstrated that the nitrogen fixation in soils under ideal conditions can add 120, 180, a maximum of 200 lbs. of nitrogen per acre per year, more than a farmer can afford to buy. Part of this will be utilized; the rest can be added to storage. (cf 3, 4)

The concept of "easily available and soluble" leads to quick results. It "shows" but, in fact, is a rather wasteful procedure. Furthermore, nitrogen-fixing bacteria can also become spoiled. If easily available ammonia or nitrate is offered, they become consumers and feeders rather than doing their job of fixation. Then we lose doubly. With properly treated biodynamic soils and management, nitrogen has never been a problem. As soon as the organic matter content exceeded 2%, these soils could build up a reserve and draw from it. The same was seen in biodynamic or B.D. Starter-treated composts. There was never a washing out of potash or a loss of nitrogen. All three — N-P-K — were always available and root acceptable, but very little water soluble.

One speaks so much of soil conservation. Today a physical, mechanical concept of conservation is foremost; water conservation has been added. Chemical conservation is the next step. Chemical erosion is threefold: (a) leaching downward, washing out into deeper layers inaccessible to plant roots, vertical erosion and becoming completely unavailable; (b) surface losses by run-off water of the soluble fraction; (c) luxury consumption and removal of excess amounts by way of crops, whereby the quality of these crops suffers also.

Conservation practices by changing our concept from the wasteful "water soluble" to one of root available and root acceptable supply of nutrients offer one surprising result; the efficiency or utilization of any kind of fertilizer material,

natural-mineral, organic — will be increased; more will be achieved with less.

We are frequently asked: In what way does the organic farmer or gardener differ from the biodynamic farmer or gardener? The difference seems to be one of degrees of intensity in applying sound and scientific principles, of consciously employing and directing the biological process. The biodynamic concept means to apply, not only organic materials as they come to hand, but to transform them into a stable humus; to introduce crop rotation, intercrops, cover crops, juxtaposition, the influences of plants upon one another, soil cultivation in an integrated system. The biodynamic concept does not sell a fertilizer for quick return but it requires your own activity and cooperation to build the soil and plant life. Maybe this is the reason why it has not become so popular in spite of its results. It asks you to do some things which you cannot buy. Those who have applied this concept conscientiously and diligently have not fared badly. They have produced good crops, good health and have maintained and even improved their soils. They have made it a business and a science, not a hobby.

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BIG NFA MEETING SEPTEMBER 23RD AND 24TH

NFA members among our readers will already have the story, but the rest should certainly know about the important 1960 Eastern NFA Conference to be held at Atlantic City, N. J., September 23rd and 24th. The sessions start at 9 A. M. on Friday, the 23rd, and will be held in the Claridge Hotel, where rooms are also available.

The varied and interesting list of speakers includes Jonathan Forman, M. D., Joe D. Nichols, M. D., Beatrice Trum Hunter, George Bockel, E. E. Pfeiffer, M. D. (Hon.), William A. Albrecht, Ph. D., Devin Garrity, Peter A. Escher, Fred D. Miller, D. D. S., and Thomas Lavin. For program, write to Thomas Lavin, National Secretary, NFA, Atlanta, Texas.

THE 1960 CONFERENCE

Some Random Notes and Recollections.

For quite a few years now it has been the job of your assistant editor to "cover" the annual B.D. Association Conference at Threefold Farm, Spring Valley, N. Y., i.e., to give members and subscribers who couldn't get there some idea of what went on. This time it is an easy task because most of the speakers have done or are doing articles based on their lectures and talks. The program ran as printed on the inside front cover of our last number — with the welcome addition of a fine paper by Dr. E. F. Winter on "Ecology". This is to be published here later.

The material in Dr. Pfeiffer's first lecture is developed further in the paper that leads off this issue. That in the second has already appeared in Bio-Dynamics, illustrated with fine color photographs of some of the chromatograms. Articles not found in this Fall issue will appear in the next.

It remains to be stated that all who were at the sessions were in agreement that it was a particularly good conference. The attendance was a little smaller than in 1959, for a very good reason: early July is no time to leave one's land. We knew this, but this year some other conferences that could not be shifted had a prior claim on the convention facilities. Our regrets to those who wrote they'd have liked to come and couldn't, and special thanks to the farmers and gardeners who sacrificed their time by coming to contribute to the sessions by speaking and participating. Next year we hope to have the sessions later in the season, as previously.

Please Note: After long discussion, the Directors of the Association decided that it has become necessary to increase subscription rates from $1.50 to $2.00 a year, and raise the cost of single copies to 75c. For those who want back numbers, 4 copies will cost $2.00 (as they would new, by way of your subscription). Association membership, which includes the quarterly and other advantages as well, remains at $4.50 a year. Subscribers who think the B.D. movement is worth supporting are urged, if they can afford it, to change over to a membership.

Needless perhaps to add, the subscription increase is to help meet *mechanical* production costs. Contributors and editors receive nothing for their work.

Going through his conference notebook, the undersigned finds a few items, from discussion periods, not likely to find their way into the other reports. Thus, in speaking after Dr. Winter's treatment of "Ecology," Dr. Pfeiffer referred to the work of certain California scientists who, he said, had licked the problem of the alfalfa beetle and other insect pests that prey on this important hay crop. They did it by the simple expedient of *strip cutting*, i.e. a natural control without requiring any pesticides. They found that when left alone, the alfalfa fields housed a community of insects including sufficient predators to keep the pests down to a point where they were not damaging. With complete cutting of large fields the natural balance was upset because the pests, being more robust, recovered while the (to us) helpful ones tended to die out. The experimenters found that with strip cutting, providing some constant habitation for a sufficient number of insects, there was a speedy self-restoration of the natural balance as the next growth came up.

Following Russ Keep's talk (Walter Stuber was unable to be present at the sessions), Dr. Pfeiffer commented that the biggest problem of the producers of natural foods here is that "we are too widespread in this geographically big country". He recalled that in Holland, where the big farm he ran had a very successful distribution set-up (which is functioning nicely again since the recovery from World War II) the average shipping distance is 100 miles, "about the same as from Golden Acres to New York City". As one instance of overcoming this problem, he cited the fact that it was possible to ship compost from the B.D. composting plant at Gainesville, Ga., to Indiana because trucks come down from there with the Hoosier Soil Blend (which Georgia growers like), and carry compost on the return trip.

Another item, interesting if one doesn't already know it: Lysine deficiency, which causes growth deficiencies in the immature organism, can show up in the adult as nervous irritation especially evident in the fact that one "can't stand metallic sounds". When the proper amount of lysine is fed, this unpleasant symptom disappears.

Different speakers repeatedly stressed the great importance of proper aeration and drainage in the soil. The professional grower learns this the hard way if he wasn't familiar with it, but the home gardener may be putting himself ahead of the game and improve his results greatly if he looks into the question under his own steam. One could go on, but the high spots are in the various articles in this and the next number, with

one exception. This was the Piano Recital by David Maddern with which the conference closed. Some people had already left, but their places were filled by Rockland County music lovers who had read of it in the local newspaper. All who heard this young pianist, who is attaining increasing recognition throughout the East, were well rewarded. While "music criticism" is hardly the functon of Bio-Dynamics, we may perhaps be allowed to pass along the comment heard from a number of those in the audience, that this pianist, besides having technical virtuosity, also conveys that intangible quality which makes music "warm and alive".

F. H.

NATURAL LANDSCAPING

ALICE HECKEL

Those of you who have attended B. D. Conferences for any length of time, or studied the literature, or better still have practiced the biodynamic methods on your farm or garden have often heard Dr. Pfeiffer speak of the soil as a living organism. You have heard him and others speak of the balance of nature, biological balance, biological control of insects, the importance of forests, waterways, light, warmth, — all the many factors which are there to be considered on a large farm, for instance. On a smaller scale, in a vegetable or flower garden, or a tiny plot where you grow your kitchen herbs and salad, (near the back stoop, so you can dash out at the last moment for some parsley for the soup or a bit of summer savory for the string beans) the same principles apply.

Now I would like you to think of the whole earth as a living organism, with all the oceans, the waterways, the lakes, and not least important the underground water (what Professor Cocannouer likes to call the "inland sea") comprising the circulatory system of this organism. The earth's atmosphere plus the sunlight is certainly not a static affair, here we can think of a kind of respiratory system, closely related to the circulation. As you know, much of the earth's water is drawn up into the atmosphere, condenses in cooler air currents and falls back again to the earth, even as oxygen is taken into our blood stream through the lungs. The soil, in a very broad sense, can be thought of as flesh, tissue engaged in a metabolic process; the green plant

covering is almost inseparable from this process — it is a part of this tissue. For muscles and bones, one might think of the rocks and mountains. You may say, what about a nervous system? Well, there are all the roots of plants, perennials and trees, shrubs, grasses, the many herbs, vines, and fruits of the earth. Then too, there are all the mysterious fibres and bundles of vessels, the chlorophyl, etc., in the plants, about which not too much is known. That plants are sensitive to light and often perform many functions in the dark, at night, not just underground in their root systems, has become well known. All the animals and the insects are also a part of this whole sensory community. I do not feel that it is stretching the likeness too far to say that this whole network seems comparable to a kind of nerve-sense system. Not that each individual plant or genus of plants, has a complete nervous system and a brain, but that the whole complex of roots and green plant covering somehow serves the earth as a whole in this capacity.

In looking about for other people who seem to share this point of view, that is, for people other than Bio-Dynamic Farmers and Gardeners, I ploughed through a number of books. One of these is called "Biologie der Landschaft" (Biology of the Landscape) by Dr. Walther Schoenichen. This gentleman has worked out a very ingenious table to support his thesis that the landscape is a living organism. He has taken the classification of organisms in their successive evolutionary stages and keyed them in with parts of a landscape or as organs of a landscape.

He begins with the simple, single living cell, with cell organs, then moves on to colonies of cell organisms, algae and related forms. In the case of the colonies of cell organisms we are dealing with algae for instance. These comprise a very active and essential element in the life of a pond. When he speaks of "cell states", he refers to a kind of *closed corporation* of cells, unlike in form, possessing differences in function — a sort of division into departments. Almost all of the plants and animals visible to the naked eye are such *closed corporations.* Next one moves toward a kind of social order, consisting of *colonies of cell states.* These are what one might call "birds of a feather" — they live together, but each performs the same processes for itself. There is no organization of *labor unions*! Sponges, coral organisms, and polyps group themselves together in this manner. The joint similar efforts of the corals, for instance, result in the beautiful coral reefs of the Pacific.

Then there are *individual states*, corporate bodies of dissimilar *cell states* with division of function among the individual members. To look at a jellyfish you wouldn't dream that it had such a complicated social organization would you? But the jellyfish, the moss animals or Bryozoa, the insect *states*, and human *states*, have something in common.

Suddenly, on this ladder, one plunges into biological communities in what Dr. S. terms a narrow sense. Here one sees an interlocking of organisms of the most varied types in a balanced biological system. Examples of these can be seen in an alluvial wood, an alder marsh, or ocean shores. This is what scientists call a biotope, which means a region which is uniform in its environmental conditions and in the animals for which it is the home ground, the habitat.

Landscape divisions which are bounded by a natural space — inland seas, beaches, river valleys and so on, are made up of interlocking biological communities of different kinds. This is a biotope in a broader sense.

Finally, Dr. Schoenichen widens his considerations to encompass what he calls the "landscape as a whole". He describes this as the corporation of landscapes of different kinds within a natural geographical area, or a man-made geographical space. As you can see he does not go quite so far as to consider the whole earth as an organism. His classification of the landscape as a whole, really only extends to something one might call a larger part or section of the whole earth landscape.

Man does not quite fit into this landscape from the scientist's point of view, except when considered as simply a higher animal. One of the effects of his existence, of course, is that he brings about changes in the landscape. He is not just a spectator, but reaches in from "outside", from the orchestra or the gallery, strips a forest, dams a stream, opens up virgin prairie and sows it to cereal for an endless succession of years, uses up the ground water, mines and quarries and leaves the barren landscape as a dead monument to his power and his *civilized* needs.

Besides this active participation in nature, where he has often disturbed the balance of biological communities so that a landscape has become lifeless — witness the region of the Tigris and Euphrates which once supported a large population; the Negev Desert, once possessed of rivers and towns; the Gobi Desert, thought to have been the cradle of western civilization — there is a kind of passive participation. The landscape also

has an influence on man, not only on the type of plant growth, the animal and insect life, but on man himself. The mountain dweller is different from those who live on the open plain; the river valley inhabitant from those who frequent the forests. The lizards, snakes, toads, and cacti which inhabit the western deserts of the United States are quite different from the plants and animals which live here in the Temperate Zone with moderate rainfall; as is the prospector with his burro a different creature from the farmer say in southern Pennsylvania. There are many ways of considering the landscape — according to the dictionary it is a picture, what one looks at within range of the eye, governed by geographical boundaries. It is, of course, much more than this. The ecologist calls a natural landscape (a climax landscape) a biological community of plants, trees, and animals, living in a delicate balance, interdependent, and maintaining itself unless disturbed by natural catastrophe — fire, earthquake, volcanic eruption, glaciers, an ice age, or that forever disturbing factor man. Where can one find such a landscape in this day and age? You must travel quite far, to a National Park, the Olympic Peninsula to see a temperate zone rain forest; or to Florida to the Everglades, to California to see a Redwood Forest. The virgin prairie land I fear has all vanished. There may be a patch or two where that incredibly deep topsoil and the native grasses still exist, mere pin-pricks when one thinks of its original vast expanse.

Another of those who tell much about the principle of working with nature rather than against her is Professor Marston Bates of the University of Michigan. He spent a couple of years in a tropical South American rain forest studying mosquitoes. However he did not ignore all the other plants and creatures but studied them with great interest and finally presented his thoughts in a book: *The Forest and the Sea.* He speaks of parts of this forest, untouched by man as yet, which still maintain a biological equilibrium. The tendency nowadays in man's changing of the biological community is in the direction of simplification. Agriculture sets as its goal pure stands of crops, single species that can be eaten directly by man; or single crops to feed animals which can be eaten by man. The shorter such a so-called *food-chain,* the more efficient the conversion of solar energy into food. "The logical end result of this process, sometimes foreseen by science fiction writers, would be the removal of all competing forms of life — with the planet left inhabited by man alone,

growing his food in the form of algal soup cultivated in vast tanks. Perhaps ultimately the algae would be dispensed with, and there would only be man, living through chemical manipulations."

Dr. Bates considers such a future both dismal and dangerous. He points to a new concept which is emerging from ecological studies that *the more complex the biological community, the more stable.* The multiplication of relationships, of checks and balances may seem inefficient, but they insure the stability and continuity of the system as a whole and thus contribute to the survival of any and all particular populations in that community.

He compares the healthgiving factors of a diversified economy to a diversified ecology in the biosphere. He speaks of monoculture as always being in precarious equilibrium. Man has created it and must always be on the alert to maintain it with chemicals and machines, all rather crude and likely at any moment to diverge to right or left and leave the way open for *epidemic catastrophe.* This the reaction of wounded nature.

He states that he is not, of course, advocating a return to the Neolithic age, that naturally we have to have the most efficient agricultural systems possible. However, he says, "But long run efficiency would seem to require certain compromises with nature — hedgerows and woodlots along with orchards and fields. The development of a variegated landscape, leaving some leeway for the checks and balances and diversity of the system of nature.

"In defying nature, in destroying nature, in building an arrogantly selfish, man-centered, artificial world, I do not see how man can gain peace or freedom or joy. I have faith in man's future, faith in the possibilities latent in the human experiment; but it is faith in man as a part of nature, working with the forces that govern the forests and the seas; faith in man sharing life, not destroying it."

These are indeed high principles, sensible admonitory words. But how can I practice *natural landscaping,* how can I apply these principles to my own half acre, or quarter acre, you may well ask.

In your vegetable garden you can apply rotation within the garden of the various crops, heavy feeders, light feeders, and soil builders; you can use B. D. compost for fertilizer, you can use tree paste, or rather B. D. Tree Spray on your fruit trees, berries, shrubs, rosebushes. You can encourage the birds to help bring about biological control of insect pests. In addition,

by using all the sound gardening practices advocated in the B. D. method you will be working with nature.

Let us consider the problems of a new home owner, in a wooded region in the temperate zone. If you build your house in such an area, in the first place don't let them take down all the trees, but leave some where they will serve as windbreak and shade. Make sure they put the topsoil aside before they dig out the cellar. Treat the topsoil with B. D. Starter and it will be even more useful and alive when you spread it again over the graded lower layers of the soil after the house is finished.

Once this compost is spread and you begin the shaping of your new environment, choose shrubs that are related to native ones. For example, dogwood may grow wild in the woods of the neighborhood. Dogwoods should do well in such a situation. Then there are hazelnut bushes, other dogwoods, flowering maples, pussy willows, steeple bush, etc.

It may be the fondest wish of your heart to have a rose garden. Work toward this gradually — there are roses that will thrive in such a landscape and look at home in the biological community, Rosa rugosa and some of the ramblers. If you try at once to plant hybrid teas they will likely revert to the original wild stock on which they were budded and turn into enormous tangles suitable for protective hedges. Instead of beautiful creamy yellow blossoms, many-petalled, there will be clusters of tiny five-petalled blossoms, and the bushes will be loaded with miniature rose hips. Incidentally these last are highly thought of by the birds. I happen to know all this about the rose bushes because it happened to us.

Some twenty-eight years ago when our house was built we knew nothing about topsoil versus subsoil — neither did the friend who designed and built the house. So when our cellar was dug, all the topsoil was buried with a thick layer of fine sticky, yellow clay. After years of trying to cover this with something — we tried myrtle and a dozen other ground covers — we finally gave up and planted honeysuckle. It forms a fine fresh green mat. One must watch it closely though, cutting it back often to keep it out of the hair of your shrubs and trees. Another area at the side of the house, after 19 years of scratching and fertilizing by the birds now spreads a green carpet of grass and clover. You might call this last a rather extreme example of working with nature.

In respect of this, it is rather difficult to produce a velvety lawn in a former woodland. It would be best to try some other

sort of ground cover, especially in the shaded areas, such as periwinkle or myrtle, and others like pachysandra in sunnier places. Woodbine, or Virginia creeper thrives around here and is attractive running over low stone walls. It turns a beautiful clear red in autumn. The squirrels and birds like dogwood berries too, by the way, as well as the rose hips. Elderberry bushes are also useful, they seem to like more moisture than others and do well in wet locations. Ornamental willows help in wet situations too, besides being beautiful.

As you gradually tame your place, you can branch out into perennial flowers and annuals. Botanical tulips, squills and daffodils naturalize well, crocuses too, and provide life and color in the spring. Snowdrops and related early flowering bulbs are wonderfully satisfactory, bravely nodding their heads above the lingering snow and ice. You will know that spring is really on its way. There may be and probably are various wildflowers which you can encourage and cultivate.

There are also many hardy azalea varieties which help to brighten the shrub parts of your plan. These like an acid soil, and will thrive in the woods earth of which we are speaking.

Of course, you may not be in the fortunate position of owning the wooded land first and having the house built just for you. You may buy a house, already built in such an area where all the trees were knocked down with a bulldozer, pushed up in a heap and burned. Find out the species of trees which grow in the neighborhood and replace those long since gone up in smoke with some new ones. They won't be as large of course, but don't forget that they will one day be big and do not plant them too near your house, or some day you will just have to cut them down.

In the last 30 years I have seen so many houses built and provided with what is called "a foundation planting". This usually consisted of evergreens of various varieties, and rhododendrons perhaps too, all set quite close together and close to the foundation of the house. Five years pass and the tops of the trees are half-way up the ground floor windows. Five more years and the windows are blocked, the trees and shrubs are bare of branches near the ground and the unsightly foundation shows again. Inside, you turn on the light to read or you must ruthlessly uproot some of the trees and shrubs, or all of them and start over again.

Let's go back to the point where you put in some trees for future windbreak, shade, or a screen of privacy between you and your next door neighbor. Here is all the rest of the open land. Usually nowadays builders even in developments push the topsoil aside and spread it again after the house is finished. So you will be pretty safe on that score. However, sometimes the subsoil has been graded when it was wet and may be packed very hard. Dig a few sample holes to find out what conditions are like underneath. If there are very hard clay layers, you had best have a subsoiler come in and loosen them up — not right through the middle of the cesspool or septic tank, however, if you aren't hooked up to a sewer system.

In a small area where machinery could not be maneuvered one can use the freezing temperatures of winter to help break up such hardpans. Borrow a soil augur from someone, or use a crowbar, to make holes about 2 to 3 feet deep every foot, checkerboard style. Fill these holes with water and keep them filled. The expanding force of the freezing water will break up the hardpan.

Once these lower layers have been loosened up sow a mixture of rye and soybeans or field peas, or rye and vetch. These are deep rooting plants. Flax also helps to break up a hard and crusty soil. Cut this crop before the rye ripens and add it to your compost heap. The stubble should be sprayed with B. D. Field Spray, then harrowed or cultivated. Sow a mixture of grasses and clovers. Some of the grasses, should be taller ones, others creeping ones, others medium height ones. This would be done probably in September or early October, sown with perennial rye grass as a nurse crop. This last, although called perennial does not function that way in this climate, but gradually dies out as the other grasses and clovers take over. In the spring you can top dress the lawn with the compost you made out of the cover crop of the summer before.

There are many other possible ways of practicing natural landscaping dependent on where you live, the climate, subtropical like Florida, or semi-arid as Tucson, Arizona. Each different spot presents varying problems and challenges. Half the fun of working with nature lies in finding out about the local plants and animals yourself. For the rest, if you follow the broad principles which underlie the B. D. method you won't go astray. You will be building on a sound biological basis, working with nature not against her. In your own small way you will be con-

tributing to the overall ecological equilibrium of the landscape, to the future continued fertility of this earth organism.

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THE SURVIVAL OF FARMING IN THESE TROUBLED TIMES

LUDWIG PIENING

It is a well-known fact that farming does not share equally in the prosperity of our economy. The disparity has been widely discussed, pro and con, and the farmer has been given much counseling as to how to overcome this pinch. In general the advice has been to streamline the production, i.e. to make better use of mechanization and to increase yields by using fertilizer and lime according to the indications of soil tests. The result has been that small and marginal farmers are squeezed out while the size and total production of the other farms is increased, bringing about a mounting total yield and thus leaving the problem of marketing unsolved.

If one would compare the diversified, self-sustaining farm of older times with the specialized and mechanized farm of today, one could say that the protective seclusion of the farm gave way to the onslaught of influences and ideas from the outside world — machinery, artificial fertilizer, sprays, the use of artificial breeding, etc. The result has, all in all, changed the pattern of farming drastically.

Formerly the farmer was embedded in nature, interwoven with the forces of earth and cosmos; his work was the outgrowth of a dialogue between him and nature. But now farming has become a business, an enterprise for the purpose of yielding profit. Strict business rules were thus applied, disregarding the laws of nature.

The moment the farmer gave up his self-sustenance, i.e., when he began to specialize and mechanize, when business laws

instead of natural laws were applied, our troubles began. Any attempt to overcome our difficulties should begin with the realization that nature, if suppressed or disregarded, backfires vehemently. The unprecedented increase in the required application of insecticides, fungicides, herbicides, is a clear indication of this.

I do not mean to say that a farmer could dispense with modern machines and methods. He couldn't afford to become old-fashioned again. If you find yourself in deep water, you have to swim, but it would be helpful to know in what direction the shore lay. By the same token, we have to make discriminating use of modern machines and methods, but should also acquaint ourselves with what has become known as biodynamic farming, for it teaches us the apparently lost knowledge of biological balance and stresses the importance of self-sustenance. The latter is a goal which cannot be reached fully, but can be attained to a high degree with regard to feed supply and to fulfilling the requirements enabling the soil to become active and fertile.

This is what we had in mind when, in 1951, we came over from Europe and settled on a farm in Montgomery County, N. Y. It is a dairy farm of 308 acres, 280 tillable. The soil is silt loam, with clay subsoil. Our main handicaps were drainage problems, heaving in winter, and the general run-down condition of the farm.

We started with 17 cows. Nineteen fifty-one being a wet year, this, and our late start, left us with but late-cut, rain-damaged hay. Several cows had to be sold, for health and various other reasons. The production was low, and quite expectedly we did not break even. Unexpectedly, this situation remained so for several years.

Working the fields in the spring was always delayed by wetness of the soil. So a plan was made to control excess water, its accumulation on level land, and erosion on slopes, by constructing diversion terraces and sod waterways. This plan was carried out over the years, and as soon as a field was drained, it was plowed up, planted to corn or oats and seeded to Birdsfoot Trefoil. Today we are beginning to introduce Narraganset Alfalfa and Viking Birdsfoot.

To retain water, where this is needful, we have introduced contour-plowing, strip cropping and the construction of stock-watering ponds.

Our production is approaching 400,000 pounds annually. By this fall we will have forty cows and ten heifers. We raise 12-15 calves annually for replacement or sale.

Production is but one side of the picture, health is the other. Our county is, as a whole, a healthy county, yet breeding troubles and mastitis do exist there. In turning our herd out to pasture this year, a check for pregnancy revealed that out of 52 head 51 were pregnant (we have fall-freshening cows). A check by the Laboratory for Mastitis Control was negative.

The development, from starting until now, was not as smooth as it may sound. It must be said that the children, whenever their school work permitted, gave us their unwavering and cheerful help. Yet, to make purchase of machinery, etc., possible, I worked part-time off the farm for three years and we did and still do custom work occasionally.

The poor condition of the old barn, and its becoming too crowded, put the question before us: complete repair and enlargement of the old barn, or the building of a new one? We decided on the latter, and in the winter of 1956-57 we started to fell trees and have them cut at the mill. Then we began sawing out the parts for the rafters. When spring came we started to build, and the first half was completed in the fall of 1957. In 1959 we built the second half. This year we are in the process of constructing two wooden silos, and perhaps a machine shed.

In 1950 the average investment of a dairy farm was $1,000 per cow kept. Today it is $1,500. This is an indication of the rapid changes within the last decade, also that a forty-cow dairy farm is a $60,000 investment. But it shows too, what can be accomplished when a family works together for a common cause, though it has meant forgoing most things which are generally considered standard or essential.

It is often said: the family farm is on its way out, and the commercial farm is the type of the future. We most certainly do not share this opinion. In the ceaseless troubles agriculture has undergone in Europe since World War I, the family farm proved to have the strongest withstanding power.

Nevertheless, abroad as well as here, countless farm helpers have left the farm for better paying jobs, and many farmers' sons left also. I do not want to deprive any child of the choosing its vocation or profession. But, at the age at which this choosing is done, what does a child know of the things it has to deal with? A child growing up on a farm may have an idea on this subject.

If nothing but drudgery, endless work and flat entertainment is offered, it will not develop any ties, and will leave the farm.

Often, both in our schools and at home, our children are made very conscious of making money. The error lies in the constant stress on increasing the standard of living, whereas it is unpopular, or considered downright ridiculous to lead a child's attentiveness towards the beauty of nature, a recognition of which would bring about an interest in nature's more specific workings. Approached in this way, a child would come to observe and compare, to admire and participate inwardly, and what otherwise would be a chore becomes satisfaction.

In looking at a blooming hayfield, the primary concern would not be only how many tons of hay it will yield, but also reverence and devotion for the forces and realms at work unveiling this beauty before our eyes. And again in the barn, there is watching the cows eating the hay, gradually building up the milk. Then comes the realization of what this stream of milk means for the cultural development of mankind. It just shows that farming is more than making money, that it is a responsibility toward your fellow man, that it simply is a matter of human dignity to produce good, wholesome food. And with the *quality concept* in our mind we would go a long way in the solving of our surplus problems.

I want to conclude by saying: Now as ever before the treasure rests within the pale of the soil. We will never lift it by force. But with understanding, with love and with much ambition we will reach the ultimate: the overflowing fertility. We will indeed be surprised at what the soil will do for us — if we take care of it.

SCIENTISTS SEEK TO PRESERVE MAN IN FACE OF CHEMICALS*

The preservation of man won prominent attention from a respected group of scientists during the recent annual convention of the Federated American Societies for Experimental Biology held in Chicago. With over 12,000 scientists attending to hear some 5,000 papers, the meeting probably was the largest gathering of its sort ever held.

"To preserve man alive in the face of all the dangers to him in this chemical age seems almost as great as creating him," one observer summed up a symposium.

Dr. Chauncey D. Leake, in opening the discussion, stressed that any chemical is a hazard and great care must be exercised

*From CONSERVATION NEWS, a publication of the National Wildlife Federation, Washington, D. C.

in their use unless the balance of nature is more seriously upset. "Man is his own worst enemy," said Dr. E. M. K. Geiling, of the Pure Food and Drug Administration, "and in seeking use of his inventive genius has brought upon himself many of the ills that beset him in his efforts to cure other ills". Dr. William J. Darby of Vanderbilt University reminded the audience that most common foods have considerable amounts of chemical poisons in them.

Dr. George C. Decker, of the Illinois Natural History Survey, called for a campaign to "READ THE LABEL," in his discussion of agricultural chemicals. He said some 7,000 combinations of over 200 different chemicals now are on the market and some are highly toxic to man and beast. His discussion revealed that farmers are privileged individuals because they are able to buy many potent chemicals from stores without a prescription or the need to even consult a veterinarian. Dr. Herbert Stocking of the U. S. Public Health Service called attention to chemical pollution of public water supplies, also heavily used for recreation.

Those attending the meeting came away impressed with the need for additional research in the field of toxicology.

THE COMMUNITY ECOLOGIST*

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The community ecologist is, so far as I am aware, a phenomenon that does not yet exist. However, it is clear that there is a place and a need for an official in a community government whose function is to foresee the ecological consequences of all projects and activities sponsored or sanctioned by the community.

Some of my scientific colleagues may be disturbed that I not only write about a phenomenon that does not exist but that I give it a name, possibly adding to the already appalling confusion in ecological terminology. However, a phenomenon, even a hypothetical one, must have a name if it is to be discussed easily, and the term *community ecologist* clearly fits what I aim to describe. I hope that any resulting confusion may be cleared up by the time the article is finished.

The excuse for describing such a government office is that

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I think it surely will come into being in the near future and that it is highly desirable that it should. Talking about it may hasten the event. If the need for this type of ecologist were recognized, men with a rather special (not specialized) background would be required, and in considerable numbers. It is conceivable that teachers of ecology and directors of graduate study might accept the idea presented here. If so they might well do both their students and society a service by helping promising young ecology students to acquire an adequate background for this sort of work. An advance formulation of a probable future profession may thus be of value in at least two ways

The function of the community ecologist, as well as some of his characteristics, may become apparent as the discussion progresses. Also some of the responsibilities of the ecological profession to society as a whole may be brought out. These cannot be too often reiterated.

It is probable that few of even the least biologically trained of us have failed to see instances where public (or private) projects have brought about results that were quite unexpected and often disconcerting. Whole chains of consequences have been touched off, sometimes by seemingly insignificant or unrelated acts.

The encroachment of salt in the ground-water in the region of Miami, Florida, after drainage of some of the Everglades Region for agriculture is a well known example.

The plague of rodents in the Buena Vista Lake bed in California some years ago resulted from unrestricted poisoning of coyotes.

Some years ago the agriculture department of a great American university carried out experiments involving heavy fertilization on a plot of university land. This field drained into a beautiful lake fronting on the campus and the city. The excess fertilizer entering the lake brought about a sudden "bloom" of algae, accompanied by foul odors. The city sanitary authorities then decided to copper sulfate the lake water to destroy the algae. This proposal caused consternation among the limnologists of the university who had long-term observation and studies in progress on the ecological features of the lake. I have no information on how the difficulty was resolved.

It is well-known that industrial pollution has ruined both recreational and commercial fisheries in many rivers in the eastern United States. Some of these same streams are the water supplies for great cities.

Equally it is a matter of record that the greater portion of Pacific salmon spawning grounds have been rendered inaccessible to fish by hydroelectric dam construction, greatly reducing the commercial salmon resources, as well as the recreation of salmon fishing.

During the first quarter of this century melon culture was a source of great prosperity in the Turlock Irrigation District in Central California. The production of high quality melons in that area depended on a relatively high water table and "sub-irrigation" or a capillary water supply from below. Demands from a small group of peach-orchard interests caused the irrigation district authorities to install deep drainage pumps and ditches to lower the water table. This benefitted the peach growers but forced the melon growers to surface-irrigate their melons. The quality of the melons then declined and melon raising dropped to the status of a relatively minor and not very profitable activity in the area, certainly not the aim of the authorities.

The above are only a few specific examples of confusion and unexpected consequences resulting from actions of public authorities or from projects permitted by such authorities. They could be multiplied by thousands by searching the records or by examining the country-side.

More serious, if less easy to pin to a specific cause, are symptoms of economic maladjustment and of ecological errors resulting from poor civic planning. Such symptoms are epidemics, poverty, "ghost towns", localized unemployment, falling water tables, "smog", dust-storms, silting of reservoirs and estuaries, beach erosion, floods, outbreaks or increase of noxious insects and rodents, and many ills that are by many thought of as simply "acts of God". Actually, very few such things are unavoidable.

Most result from failure to evaluate properly the long-term effects of policies, projects, and enterprises. The development of one resource may in all probability have effects, either favorable or unfavorable, on the status of other resources.

It is not a common trait of people keenly interested in one enterprise to be deeply concerned about its relation to others unless financial or political consequences are obvious. The commercial promoter or developer rather than looking for unfavorable features of his project is often quite resentful or scornful toward anyone pointing out such things. He may even make

active efforts to conceal bad effects. The bureaucratic promoter of a public activity may often be either enthusiastic about his work or an "empire builder." In either case he is not likely to go out of his way to look for obstacles or for possibilities that might cast doubt on the wisdom of what he is doing. Recent history is full of examples where such officials have fought bitterly for projects that were clearly not in the public interest.

If the existence of such confusion and such attitudes is admitted it is clear that a means for study of the entire context of public interest is needed, as well as a means for applying the results of such study to the pertinent problems.

The great majority of such affairs, on any governmental level, concern the environment of the community, taken in a broad sense. This includes, in addition to man's immediate physical environment, the general environment of his agriculture and fisheries, which yield his food, the earth, which yields his fuel, minerals, and water supply, and the often distant sources of his raw materials and energy. It further includes the factors of beauty and comfort that elevate life from mere helpless existence to something rewarding and worthwhile.

These environmental matters are properly the concerns of the science of ecology. Ecologists, if broadly enough trained, should be the group most able to deal adequately with these problems. A common definition of ecology is "the study of the interrelationships between organisms and their environments". Man is the most important of these organisms and human ecology, under various names, is becoming more and more a powerful branch of ecology. Therefore, at every governmental level where decisions involving these environmental relations are made there would seem to be not only a place for, but an acute need for ecologists. In the local community — town, city or county — in the state, regional and national governments and authorities, indeed, even in international or intergovernmental organizations there is a function waiting for public or community ecologists.

It may be objected that we already have public planning agencies in many communities and that they are merely ecological groups under another name. Actually, though this would certainly be a desirable state of affairs, it is seldom really the case. Public planners are often engineers, economists, landscape architects, or most often, politicians, but seldom ecologists. And it is not likely that this situation will change soon.

Rather than try to break into the established field of public planning it might be best to introduce something entirely new (at least in America) — the *community ecologist* as a separate and autonomous office within the community government. It might be well to give him no specific duties except to become thoroughly familiar with every aspect of the community environment, to develop an understanding of its interrelationships and functioning, and to consider critically every activity and decision of each of the departments and agencies of the government. These should be studied in terms of their probable or possible effects on all other aspects of the community life. Written opinions should be submitted directly to the responsible head or executive. The ecologist should probably not have veto power but his opinions should be made matters of public record. His tenure of office should not, of course, be subject to political pressures. His position should be reasonably secure and he should expect to make a career of it. To start with, at least, his function should be one of evaluation and criticism. When he has established himself firmly and demonstrated what he can do in this capacity it may be possible for him to assume certain planning functions. He might then even initiate ecologically sound public policies and enterprises.

Breadth of training cannot be overemphasized as a qualification for this position. It should not only include ecology courses and the obviously necessary botany, zoology, and bacteriology, but chemistry, geology, soil science, agriculture, economics, and geography. An absolute essential would be a fluent and effective command of the English language to enable the ecologist to express his ideas in a clear and convincing manner. Two or more foreign languages would open to him whole sets of ideas and even principles that might never or only with long delay come to his attention in English. In addition to academic training, demonstrated ability to work out a detailed problem in interrelationships would be equally a requisite.

If positions of this sort should open up tomorrow, I wonder how many adequately qualified young ecologists would be available to fill them.

LAND ADMINISTRATORS BLEND NEW CONCEPTS WITH OLD*

Since World War II, the tempo of American Empire building and chronic unrest has again turned toward the setting sun and the broad expanses of our western heritage.

Following the first grim thrust symbolized by the Conestoga wagon and the trails of heartbreak and Utopia leading to Oregon and California, there was a lull, a leveling-off period, a regrouping of forces, a time when people learned to survive in a new and strange environment.

In the 1940's with an alien enemy endangering the Pacific coast, much of our military might was concentrated there and it was immediately followed by industries to support it. Because of available land areas and natural resources, these industries became permanent and in turn were followed by other types of supporting manufacturing. Thousands of defense workers and youngsters in uniform saw the Rockies, the Great Basin and the Pacific for the first time. Many liked this land of the big sky — saw opportunity in this new stir of activity — and decided to stay. As a result more than one sleepy mining or cow town mushroomed into an industrial center, with sophisticated suburbs that rivaled anything back East.

It was apparent that a sleeping giant was beginning to stir. In addition to the war impetus, the development of underground water, mechanized farming and easy financing caused a surge of desert land entries in the western states. An expanding population, leisure time, favorable climate and eager speculators brought on a flood of applications for the lease and purchase of small tracts in southern California, Arizona, Nevada and Idaho. Added discovery of uranium, oil and gas in many western regions increased mining claims and the lease of Public Domain lands, which heretofore had been considered of little or no worth. These overnight prospectors, seeing a pot of gold at the end of the rainbow, followed the pattern of their ancestors and showed little concern for any long-range management of public domain. It was free land; everyone's land; no man's land.

The pattern of western life which had become settled and staid before World War II was again in the throes of change. A hundred years ago, the Indians resisted settlement. This was followed by the era when cattlemen and sheepmen resisted each other and both resisted the nester.

Then, fifty-odd years ago all forces more or less combined

*From CONSERVATION NEWS.

with the lumbering industry to resist an alarming innovation of federal authority, first symbolized by the U. S. Forest Service. Through this agency came the first establishment of grazing allotments, soon followed by an attempt to reduce the number of cattle and sheep in keeping with the range, much of which had already been badly abused.

An example of the slow and painful road to range improvement, and the enlightenment of public thinking, is the Hobble Creek area of the Unita National Forest in Utah. The Right Fork was included in the Forest in 1905, the Left Fork in 1910 and further purchases were made under the Act of 1935. For 55 years there has been a constant and determined resistance to any reduction of stock allotments as recommended by the Forest Service. Now, with increasing populations reflecting a profound concern for watershed protection and recreation, the Forest Service drastically cut the stock allotments on Hobble Creek. This action precipitated a demand for a public hearing by the permittees. This hearing was recently conducted, but one wonders if the Forest Service was justified in being so patient and long-suffering.

In the main the Forest Service has been patient and long-suffering because of public indifference, which leads one to wonder what sort of lethargy dominates public attitude and Congress to allow a few local permittees to thwart the dictates of good land management of value to so many for such duration. Like examples can be documented in other National Forests of the west, such as the fight in New Mexico and Arizona for water sources emanating in the National Forests.

By and large, forest industry has endorsed the philosophy of sustained yield as a part of the National Forest management, as more professional foresters take over the business. Proper range management is nothing more than a form of sustained yield for the livestock industry.

In 1934, Congress passed the Taylor Grazing Act which established the Grazing Service. In 1946, the General Land Office and the Grazing Service were combined to form the Bureau of Land Management. Some stockmen, accustomed to free range, pawed the earth and threw up a cloud of dust.

The lofty and flowery pronouncement of multiple-purposes, as set forth in the introduction of the Taylor Grazing Act, began to wilt under the scrutiny of close reading. What it amounts to is that BLM is charged with the administration of 477 million

acres of public domain with one hand tied behind its back. The Forest Service has been given more positive authority to manage the National Forests. Both services are attempting to manage resources that belong to the nation, to the public, to the individual citizen, the total wealth of which cannot be computed. Too many damn their efforts — too few attempt to ascertain their problems and the limitations of their jurisdiction. The authorities extended through Congressional acts are often grossly exaggerated through rumor and idle gossip.

But the sleeping giant continues to stir and flex its muscles. Today, much of the west has marvelous road systems, inviting migrant tourists by the thousands. Some stay and put down roots. The public domain, with its seemingly empty stretches of broadening mountains, forests and deserts, both challenges and beckons. Some are content with a plot of ground and a home, others view these public lands as an opportunity for scheming, speculation and quick wealth regardless of the havoc they may inflict. As a result, the administrators of public lands have to draw new sights on changing conditions. Some of the old land laws need revising to meet these changes and to give better protection to the public's property. Too often in public business of this kind the barn door is locked after the horse is stolen.

All these changes have brought recreation into sharper focus and the public lands administrator must blend the old with the new. People are demanding that more land areas be dedicated to recreation.

Better range management has increased the numbers of big game animals, often to compete with livestock; and there are those who maintain that the people's game should have priority on the people's land. Some stockmen take a rather choleric view of this encroachment.

State game agencies have taken advantage of this upswing in game populations and now widely advertise the wonderland of opportunity for fall hunting seasons. All this encourages new hostelries and services that redound to the economy of many communities formerly relying on cattle, mining or logging.

People bring about changes with the same irresistible force that moves glaciers. The nation still looks west to where the greatest problems of resources management are yet to be solved, and where, in spite of all the fanfare of opportunity and economics, water will be the determining factor of all growth and prosperity.—ERNEST SWIFT.

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IT IS UP TO EACH INDIVIDUAL

In one of his pungent editorial articles in "Conservation News" Ernest Swift described what happens to our bird life (which, incidentally, as far as many species are concerned, plays such an important role in our fight against plant pests) when we just "pass a law" and then leave it to the Government.

"Today", he comments, " 'free as a bird' is a term used loosely. To the bird it means surviving six months of shooting during the hunting seasons, twelve months of chemical warfare, and a constant search to find a patch of water with food. We have now allotted reservations to our bird life with the same magnanimous social justice that we allotted them to the Indian. Both the Indian and waterfowl might be better off under the jurisdiction of the State Department, qualifying for foreign aid."

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